Maths in Biology

**Arithmetic and numerical computation Answer sheet**

**Maths Workbook Section 1: MS 0.1**

1. a) 38,000g

b) 20,000 cm2

1. a) 1.2dm3

b) 1200cm3 / 60 = 20cm3

c)20,000mm3

**Maths Workbook 1 Section 1: MS 0.2**

1. a) 7.5 x 104

b) 3.5 x 10-5

2. a) 33900

b) 44700000

3. a) 7 x 10-3

b) 3.5 x 10-5 = 0.000035

0.007/0.000035 = 200 tablets!

**Maths Workbook 1 Section 1: MS 0.3**

1. 5:7
2. 0.71:1
3. a) 1:2

b) 1:1.97

1. 5.8-0.8 = 5.0

5.0/0.8 x 100 = 625%

5. 32.5-10.7 = 21.8

21.8/10.7 x 100 = 203.7%

6. 0.36/0.88 x 100 = 40.9%

**Maths Workbook 1 Section 1: MS 0.4**

1. 5
2. 97.01 = 100 AND 1.89 = 2 SO 100/4 = 25. The answer of 25 is likely to be correct

**Maths Workbook 1 Section 1: MS 0.5**

1. a)343

b)32,000

1. a) 100,000

b) 10 hours

1. a) 10 5. = 100000

b) log10 90,000,000 = 7.95

c) log 10 150,000,000 = 8.18

Stationary phase

**Workbook 2**

**Handling data - answers**

**MS1.1**

1. a) 0.07

b) 1.43

1. a) 0.00578

b) 1.4

1. 0.37cm3s-1 (i.e. 2sf)

**MS1.3**

1.

|  |  |
| --- | --- |
| Concentration of acid/M | Volume of oxygen produced/cm3 |
| Repeat 1 | Repeat 2 | Repeat 3 |
| 0.0 | 30.2 | 41.3 | 40.5 |
| 0.1 | 25.0 | 22.7 | 36.6 |
| 0.2 | 18.3 | 18.5 | 17.9 |
| 0.3 | 14.9 | 12.4 | 14.7 |
| 0.4 | 5.7 | 7.6 | 9.1 |

2. Line graph – time is a continuous variable

3.

**Class boundaries:**

The class boundaries are 0, 4, 11 and 19.

(remember that this is age in years):

**Class widths:**

The class widths are therefore 4, 7 and 8.

**Frequency densities:**

12/4 = 3

14/7 = 2

48/8 = 6

The histogram should look like this:



1. 1. 260

2. 100

 240

 =

 5

 12

1. a)
* Total number of ground finches decreases from 1976 to 1978
* In 1976 the numbers of ground finches with particular sizes of beaks ranged from 0-65
* In 1978 the numbers of ground finches with particular sizes of beaks ranged from 0-12
* The range of beak sizes decreased between 1976 and 1978
* In 1976 the beak size ranged from 6mm to 11.5 mm
* In 1978 the beak size ranged from 8.1 mm to 11.4 mm
* There were less smaller beak sizes in 1978

b) the mean number of seeds per m2 decreased between 1976 and 1978. Therefore less food for the finches. Therefore less finches will be surviving long enough to breed.

The mean mass of seed increased so bigger beaks were an advantage and smaller beaks were not. So bigger beaks were selected for and survived and finches with smaller beaks did not survive.

**MS 1.4**

1. MEAN = 212/9 = 23.5 OR 24

MODE = 22

MEDIAN = 22

**MS1.5**

1. As height increases, shoe size increases.

This is a positive correlation.

For example: a height of 170cm correlates with a shoe size of 8.5 and a height of 186cm correlates with a shoe size of 13

Most points are clustered around the (imaginary) line of best fit indicating a strong positive correlation. A few points are further away than the rest, for example, a height of 174 cm and a shoe size of 8.

Maths in Biology

**Workbook 3**

**Geometry and trigonometry – answers**

1. Surface area = 10x3 = 30 x2 = 60

Plus 2x3 = 6 x4 = 24

60 + 24 = 84cm2

Volume = 10x3x2 = 60cm3

1. Surface area = 150.8cm2

Volume = 141.4 cm3

1. Cell A surface area = 0.0000126 or 1.26x10-5

Cell B surface area = 0.000113 or 1.13x10-4

Cell A volume = 0.00000000419 or 4.19x10-9

Cell B volume = 0.000000113 or 1.13x10-7

Cell A surface area: volume ratio = 3007:1

Cell B surface area:volume ratio = 1000:1

Therefore cell A has the biggest surface area to volume ratio for diffusion of substances.

Extra practice?

An earthworm is 9cm long and it’s body has a diameter of 0.6cm. By modelling the body of the earthworm as a cylinder, estimate its surface area to volume ratio.

Answer:

(Radius = 0.6/2 = 0.3)

Surface area = 17.5cm2

Volume = 2.5cm3

Surface area to volume ratio = 17.5:2.5

Simplified = 7:1